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EP 0539143 A EP 0524814 A WO 93/20546 A
US 5177685 A

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On-line databases: WPI

(54) Information system using GPS

(57) A portable information system using Global Positioning System (GPS) data as a key to retrieve audio and video from a database.

On a journey the system can identify and describe places of interest or the history of nearby buildings. The user can also search for specific things, such as landmarks, hotels, shops or even products within a radius of the present position.

Audible menus and voice command are incorporated allowing the user to select data retrieval criteria and to give hands-free and eyes-free control while driving, flying or walking.

As the user's GPS position, direction, speed, altitude and time of day change the system automatically retrieves appropriate data from the database and plays it to the user.

The device incorporates a CD database and can also access broadcast databases. It can auto-dial via cellphone using database numbers.

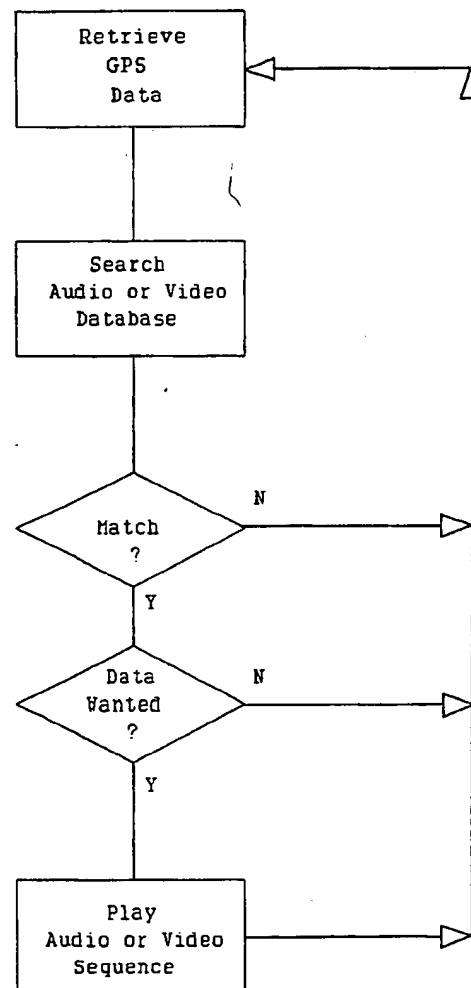
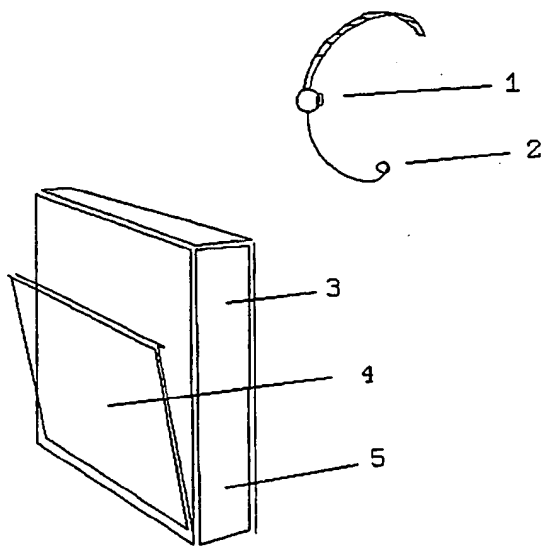
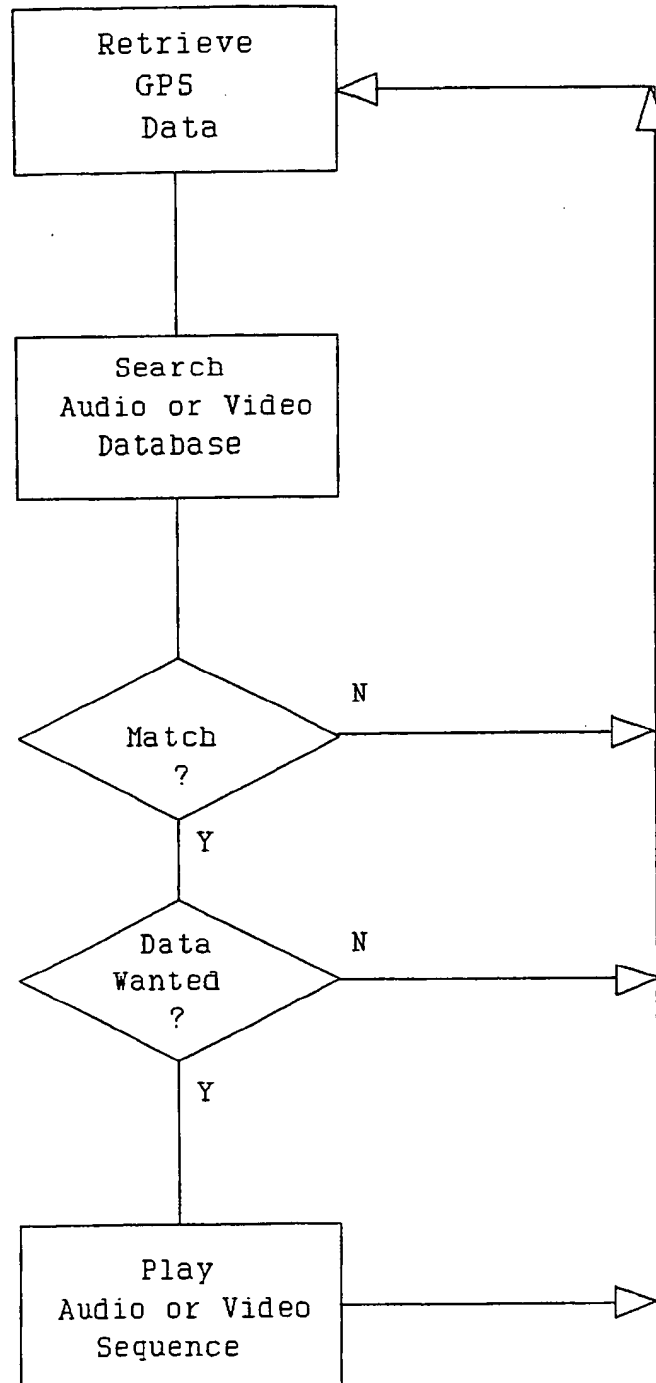


Figure 2

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Figure 1



**Figure 2**

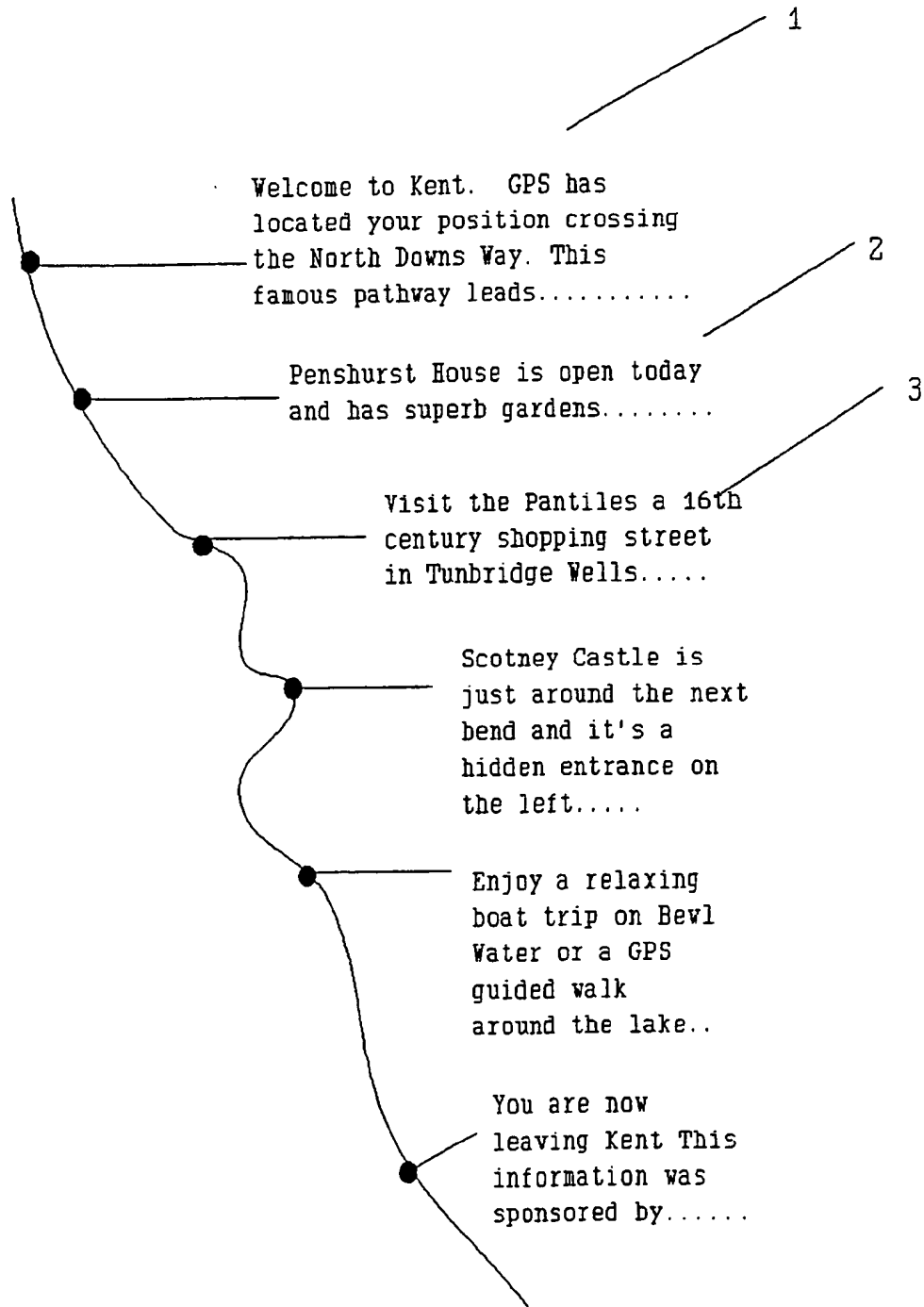


Figure 3

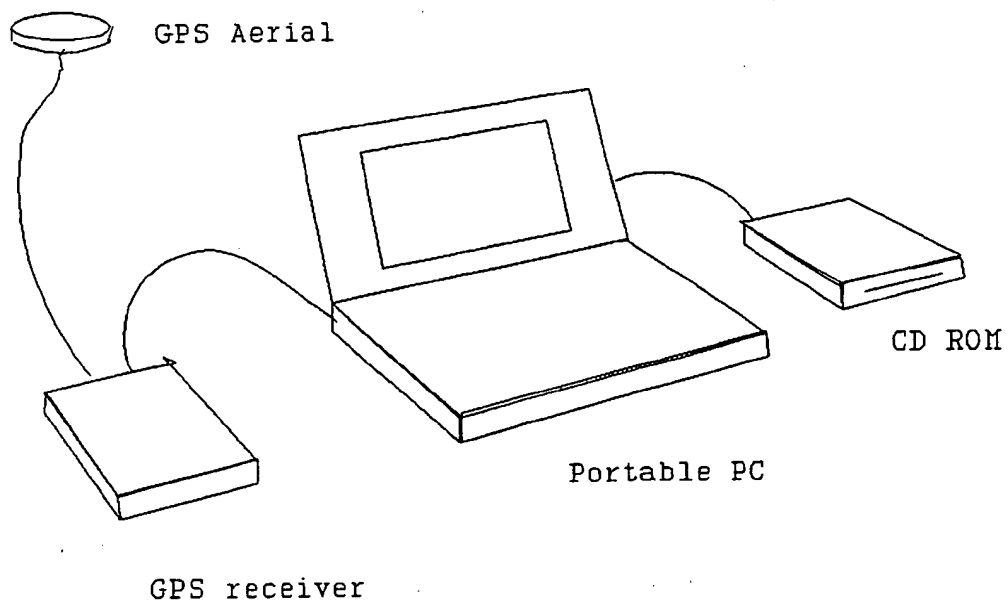


Figure 4

-1-

GPS Explorer

This invention is an information system using the US DoD Global Positioning System (GPS)

GPS is now well known in the field of navigation. Most portable GPS receivers give the user's position in terms of latitude and longitude or bearing and distance, both of which methods can be cumbersome to plot onto a chart and use. Moving map displays show positions more clearly, although their applications remain rather limited, due to the need for a screen and the danger of distraction from the task in hand, such as walking or driving a car. However, by providing user friendly audio information these limitations can be overcome and a range of new applications opened up.

Navigation is not the only use for GPS and many new applications are envisaged in which the user has no interest in knowing his position but simply wishes to know the history of a nearby building, the nearest place for lunch or to be told about places of interest along the way. The fact that the information the user requires comes from a device which uses GPS to access a database need not be apparent.

The invention, referred to as GPS Explorer, is a portable audio information system which uses GPS data as a key or keys to retrieve digital audio from a database contained within the device or attached to it by any means or received by any means including telephone, radio or television broadcast.

The device may also include the facility to retrieve still and motion video sequences from a database contained within or attached to the device by any means or received by any means including telephone, radio or television broadcast.

The device constantly monitors it's position, speed, direction of movement, the time and any like data by reference to a GPS receiver either incorporated within the device or connected to it by any means. Whenever the device detects a change in any GPS parameters, such as a change in location or time, it will use the new GPS data as a key or keys to search the database including received broadcast data and retrieve any data records which directly or indirectly match or relate to the new GPS parameters. Before being output as audio or displayed, the retrieved data will be checked against the mode of operation of the device and against other selection criteria, to determine which, if any, of the retrieved data items are to be presented to the user. A rolling log of messages will be kept to avoid needless repetition.

The device may be controlled by voice command or by keyboard, switch or joystick, directly or remotely. The user may select mode of operation of the device, data retrieval criteria and other operating criteria.

The device has an audible menu system which when used with voice command, enables the device to be used hands free and eyes free. Feedback protection avoids the audio output triggering the voice input system.

The device may be fitted with a telephone interface enabling telephone calls to be placed to numbers retrieved from the database or broadcast data.

The device may be fitted with an interface for the attachment of optical, magnetic, radio or other devices capable of inputting data for the purpose of identifying location, products, persons, vehicles, systems, temperatures or any environmental variables.

The device determines user orientation, direction of movement, speed, pitch and roll, altitude, rate of climb or descent, and the user's direction of view in terms of bearing, angle of azimuth and range.

An audio only version of the design will now be described by reference to the accompanying drawings.

Figure 1 shows the audio only version of the device comprising: audio earpiece 1, microphone 2, the GPS receiver 3, the CD drive 4 and the processor 5.

Figure 2 shows the basic logic used to monitor the user's position and to retrieve and play the appropriate audio.

Figure 3 shows a map on which large dots represent the positions determined by GPS at which specific audio phrases will be selected from the database or radio broadcast and played. Samples of typical audio phrases are shown numbered 1-6.

The GPS latitude/longitude co-ordinates of places of interest such as historic buildings, castles, villages, parks, lakes, mountains, panoramic viewpoints and so forth may be digitized from maps or by on site survey. Audio describing each place of interest will then be recorded and stored, in compressed form, with corresponding GPS co-ordinates, in a database on a compact disc (GPS-CD).

The portable GPS Explorer may then be used with such a GPS-CD database to provide information to the user who may select one of the device's many modes of operation, such as for example:

En Route mode:

Figure 3 shows a typical journey by car along a major road. By constantly monitoring GPS data, the device will determine when each of the locations 1-6 has been reached, the corresponding audio phrase will then be retrieved from the GPS-CD database or broadcast data and played to the user through an earpiece or loudspeaker.

There may be several locations at which broadly similar messages would be applicable, such as approaching a village from the North, South, East or West. In this case, the appropriate audio messages may be assembled from several phrases with variables such as left and right inserted as determined by user orientation, thus enabling more economic use to be made of available database space.

Guidance mode.

The GPS lat/long location of a road junction will be digitized and audio recorded for each direction of approach to each junction. The device will identify the users position and direction of travel on the approach to a junction by reference to GPS data and then retrieve the appropriate audio in advance of the junction to act as an audio signpost. The audio signpost will not be restricted to just place names as it may include much more information about road type, places of interest en route, warnings such as no fuel for 50 miles and so on.

Destination oriented guidance mode.

When this mode is first selected the user will be prompted to choose a destination. A route from the present position to the destination will be determined from routing data. The device will then provide only the single direction needed at each junction to reach the destination without referring to unwanted directions.

Tour mode.

The user will be able to select a tour either from the main menu or when offered the option en route. The system will then provide tour guidance and point out things of interest.

What's on mode.

The device will examine the co-ordinates of all the specially identified places of interest in the immediate area, gradually working out from the present GPS location. The device will then play a short audio phrase for each activity to briefly arouse the interest of the user. The user may then select any activity and obtain further details for deliberation, after which GPS guidance will be provided to the venue on request. An auto dial telephone number may be added for use via the telephone interface, to enable reservations to be made for hotels, theatres or similar venues without the need to write down then dial the number.

Walking Mode v Driving Mode v Flying Mode.

The system will adjust the presentation of messages to suit the mode of travel selected by the user and the GPS calculated speed. For example, when walking slowly around a town the user will be given more detail than when driving through the town or flying overhead.

Application specific modes

Certain applications such as general aviation may require a special mode of operation to focus the users attention on certain data. Having selected general aviation mode, the system will identify the users GPS position, altitude and speed in relation to aviation related points such as airports, restricted areas, danger areas, light aircraft routes, air traffic control boundaries and so forth. The device will then provide the pilot with audio guidance, airspace alerting or an information retrieval by voice command and audio response.

Audio Commands

- Menu - plays the main menu
- OK - selects the last option stated
- Repeat - replays the last audio phrase
- X Mode - selects a specific mode
- Stop - stops the audio
- Start - starts the audio
- Earpiece - switches to earpiece
- Speaker - switches to loudspeaker
- Skip - skips the present audio phrase
- Position - gives position from...
- Distance - gives distance from start, to...
- Log on - starts a log of position data
- Log off - stops log

An audio visual version of the design will now be described by reference to the following drawing:

Figure 4. Shows a version of the audio/visual system based on a standard portable PC.

Still and/or motion video sequences will be stored on GPS-CD along with the GPS co-ordinates described in the audio example above. This visual data can then be accessed in several modes:

Pre-view mode:

Before visiting a remote location, the user may use the device to pre-view the various places he intends to visit. Any visual sequences may be retrieved and played simply by entering the name or lat/long of the desired place or by selecting it from a list given by the system.

More detail mode:

In an audio mode, once audio details of a venue have been given by the system the user will be notified by a bleep or prompt if pictorial information is also available from the database. The user may then select it if required.

Simulation mode:

Having arrived at a physical location or identified it in pre-view mode, the user may access the database to obtain a computer based simulation of some aspect of the location. For example to see the route of a proposed new road or the simulated facade of a proposed new building. By walking around the physical site, as the GPS data changes so will the simulation to illustrate the simulated views from the new physical position taking into consideration the users orientation, height, direction of view, view angle of azimuth and time of day. The simulation may be presented on a display screen or any form of image projection system such as a virtual reality helmet or other device. If used in conjunction with a head up display the user will have both the present image and simulated future in view simultaneously enabling comparison.

A real time version of the device will now be described.

To enable the user to have access to up to the minute information the device incorporates a radio or television receiver to receive specially broadcast regional data transmissions. These are stored in the device on receipt and then handled in the same way as other database data described earlier. In other words, the device uses it's GPS calculated position to select data relevant to the user's immediate location or specified mode.

The real time system could provide the user with access to: local weather, pilots weather reports en route and for specified destinations, flight delays, details of special events, hotel room availability, road conditions, audio guided diversions, financial market updates.

A virtual reality version of the device will now be described.

Virtual reality is a term used at present to describe a computer generated three dimensional image which when observed using a special form of projection system or helmet, creates the illusion of reality and allows the user to move through it and to react with computer generated objects.

The new device will combine the real world image with computer generated images. The device obtains it's real world frame of reference from it's GPS position. This allows the device to generate virtual objects so they are correctly located within the observers real world. The resulting computer generated image may be projected into the users field of view using split image spectacles. Alternatively the computer generated objects may be overlaid on a video picture of the real world and the resulting composite image projected to for an observer wearing an artificial reality helmet.

The device would enable a fire or rescue crew visiting say an oil rig to superimpose structural, electrical or hazard data onto their real world view of the structure, giving them safety related information and audible hazard alerts.

The device would also enable a user visiting the site for a new building to see the computer generated image of the new building superimposed in the landscape. The computer generated image will change as the user's GPS position changes when he walks around the site.

Claims

1. A device which uses GPS data to select audio phrases from a database or radio broadcast.
2. A device as in claim 1 which is provided with a still or motion picture system in which the pictures are retrieved either from a database or radio or television broadcast data.
3. A device as in Claim 1 or 2 which is provided with a menu system which uses the human voice or a display screen to describe options.
4. A device as in Claims 1-3 which is controlled by spoken audio command or by keyboard or by any form of joystick or switch.
5. A device as in Claims 1-4 which is provided with a radio or radio interface to receive broadcast audio or broadcast data.
6. A device as in claims 1-5 which is provided with a telephone or telephone interface such that a telephone call can be made using telephone numbers from the database or broadcast, without the need to dial the number.
7. A device as in claims 1-6 which is provided with a an optical, magnetic, radio or other device capable of inputting data for the purpose of identifying location, products, persons, vehicles, systems, temperatures or any environmental variables.
8. A device as in claims 1-7 incorporating a system for determining user orientation including: direction of movement, heading, rate of climb or descent, pitch angle and rate, roll angle and rate. This system will also determine direction of view as compass bearing, azimuth and range.
9. A device as in claims 1-8 with the facility to present the user with a visible and/or audible simulation of an alternative three dimensional environment based on his position and orientation and direction of view in the real world as determined by GPS.
10. A device as in claims 1-9 with more than one channel for simultaneous use by a group of users.
11. A device embodying any combination of the features described in claims 1-10.

Patents Act 1977 Examiner's report to the Comptroller under Section 17 (The Search report)	IO Application number GB 9310175.6
Relevant Technical Fields (i) UK Cl (Ed.M) G1F (ii) Int Cl (Ed.5) G01C 21/20	Search Examiner T S Sutherland
Databases (see below) (i) UK Patent Office collections of GB, EP, WO and US patent specifications. (ii) ON-LINE DATABASES : WPI	Date of completion of Search 17 March 1994 Documents considered relevant following a search in respect of Claims :- 1-11

Categories of documents

X: Document indicating lack of novelty or of inventive step.	P: Document published on or after the declared priority date but before the filing date of the present application.
Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.	E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.
A: Document indicating technological background and/or state of the art.	&: Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages	Relevant to claim(s)
X	EP 0539143 A (PIONEER) see Claims 4, 5 and 6	1-4,7
X	EP 0524814 A (PIONEER) Figures 1 and 2, column 3 line 34 onwards	1-4,7
E,X	WO 93/20546 A (PARIENTI) Figures 1 and 2, note English abstract	1,3-5,7
X	US 5177685 (MIT) column 1 line 67 - column 2, line 3, column 7, lines 60-63, column 11 lines 49,50 etc	1,3-7,10

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